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## Labor Productivity and Foreign Direct Investment in the Indonesian Manufacturing Sector

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### Abstract

*This paper investigates the determinants of foreign direct investment (FDI) inflow, focusing on the effect of labor productivity in the Indonesian manufacturing sector. Indonesia has the advantage of abundant labor supply in attracting FDI to bring positive externalities to its economy. Based on this background, this paper is aimed to study and to improve FDI inflow through a random effect analysis of 19 manufacturing industries from 2001 to 2014. The empirical result shows that labor productivity, wages, and export have become significant factors that attract FDI. FDI inflow in this sector tends to target non-labor industries. For the labor-intensive industries, the primary strategy is to increase labor quality through improvement in education, training, internship program, and worker certification. Improving research and development climate, and maintaining the quality of labor through health and social protection regulation can attain improvement in non-labor intensive industries.*

**Keywords:** foreign direct investment; labor productivity; the manufacturing sector

### Abstrak

*Penelitian ini mempelajari faktor-faktor penentu arus masuk FDI khususnya produktivitas tenaga kerja, di sektor manufaktur di Indonesia. Studi ini menggunakan data dari 19 industri di sektor manufaktur Indonesia tahun 2001 sampai 2014 menggunakan analisa data kuantitatif. Hasilnya menunjukkan bahwa produktivitas tenaga kerja, upah, dan ekspor merupakan faktor signifikan yang mempengaruhi FDI. Analisis lebih lanjut menunjukkan bahwa arus masuk FDI di sektor ini cenderung menargetkan industri yang tidak tergolong industri padat karya. Dengan demikian, diperlukan pendekatan yang berbeda untuk meningkatkan setiap variabel berdasarkan intensitas faktor produksi industri. Untuk industri padat karya, strategi utama untuk menarik FDI adalah meningkatkan kualitas tenaga kerja melalui peningkatan pendidikan, pelatihan, program magang, dan sertifikasi pekerja. Di sisi lain, peningkatan produktivitas tenaga kerja di industri bukan padat karya dapat dicapai dengan memperbaiki iklim penelitian dan pengembangan teknologi, dan menjaga kualitas tenaga kerja melalui peraturan perlindungan kesehatan dan sosial.*

**Kata Kunci:** foreign direct investment; produktivitas tenaga kerja; sektor manufaktur

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## Introduction

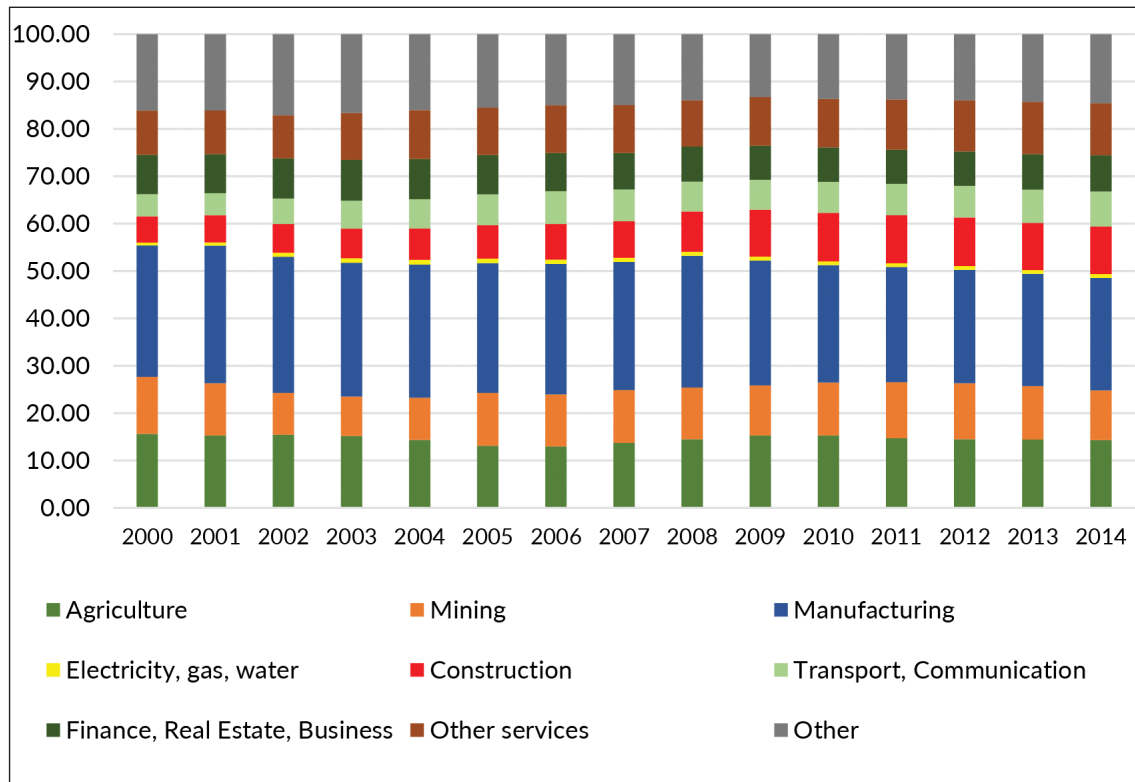
Foreign direct investment (FDI) is one of the most important sources of financing for developing and less developed countries. Foreign private investment is the part of output used by private firms to produce future output that comes from transnational or multinational enterprises in foreign countries, which are concerned with the accumulated volume of capital (Krugman et al., 2012). Besides providing additional investible resources and capital formation, FDI might also transfer production technology, skills, innovation, and organizational and managerial practices between locations, as well as access to international marketing networks that are crucial to developing a country's economy.

Foreign private investment categorized into two forms, which are inward and outward foreign direct investment. Outward FDI refers to direct investment abroad, while inward FDI refers to direct investment in host countries or direct investment that comes from abroad. Foreign direct investments believed to have an essential role in economic development, especially for emerging countries. Several studies have found positive externalities caused by FDI such as raising the productivity of domestic firms (Caves, 1999). FDI inflows usually come in the form of resource packages, such as capital, production technology, organizational and managerial skills, marketing know-how, and market access of the Multinational Enterprises' networks (Kumar, 2003). Besides these spillover effects, FDI might also lead to economic structural changes when the existence of Multi-National Corporations (MNC) trigger the changes in market structures and competitiveness and improves resource allocation as well as overall welfare (Kokko, 1996).

There are two categories of FDI, based on the motive of a multi-national firm in allocating their investment aside their home country, which is vertical FDI and Horizontal FDI. Vertical FDI is mainly driven by production cost differences between the two countries, while horizontal FDI caused by trade cost minimization. According to UNCTAD (1996), as cited in Nunnenkamp & Spatz (2002), globalization has made the size of national markets less important while cost differences between locations, the quality of infrastructure, the ease of doing business, and the availability of skills have become more critical.

Foreign investment had used as a source of economic development funding in Indonesia since 1967 when the government regulation No.1/1967 about foreign investment was issued. The main purpose of this regulation was to support potential sectors which lack capital and to raise foreign economic agents' trust in doing business in Indonesia. Since then, the Indonesian government has made many efforts to maintain favorable investment climate in the country, such as the establishment of National Single Window for Investment Coordinating Board (BKPM) in 1971 to facilitate foreign investment (and later the government upgraded its authority to become the only national agency that regulates investments since 1977). Recently, this board issued the regulation of the Head of Investment Coordinating Board no. 14/2015 as an investment application procedure that replaces the previous regulation and regulates domestic and foreign investments in all sectors including the manufacturing sector.

Figure 1. GDP Share per sector, Indonesia, 2000–2014



Note. Author's calculation based on BPS data (n.d).

Figure 1 shows that the manufacturing sector has a significant contribution to the economic development of Indonesia. According to the Central Bureau of Statistic, this sector has the highest share of gross domestic product, roughly around 25%, from 2000 to 2014. The sector also absorbs more than 12% of the Indonesian labor force on average every year. Even though, many observers believe that the Indonesian manufacturing sector might be declining (Tadjoeddin et al., 2016). Indonesia has at least one primary source of comparative advantages in its manufacturing sector, which is the abundant supply of labor force. Furthermore, the Asian Development Bank (2013) underlined the importance of manufacturing in the context of the structural transformation of the economy in order to achieve the level of the high-income economy. Expecting many benefits, Indonesia has been active in inviting FDI inflows in order to encourage its economic growth.

A fair amount of research examines the factors that affect the amount of FDI inflow. Most of the studies examine market size as the traditional factor of FDI inflow which can be measured by GDP, per capita income, or size of the middle class (Chakrabarti, 2003; Noy & Vu, 2007; Ramirez, 2008). Along with those that study market size, there are a few studies about the influence of prospect of growth variable, which can be represented by economic per capita growth, on FDI inflow such as Durham (2004), Fan et. al., (2007), Lamsiraroj (2016), and Alvarado et.al. (2017). Other studies have also examined trade openness as a factor that determined FDI inflow into an economy. The World Bank (1993) and Yanikkaya (2003) adopt full measures of trade openness by using total trade volume as a percentage of GDP,

while Sin & Leung (2001) and Moosa & Cardak (2006) use partial trade measures such as using export as a percentage of GDP.

A study was conducted in Indonesia that examined FDI-international trade relationship and focused on the manufacturing sector in Indonesia based on industries' international competitiveness (Rahmanto, 2016). However, the study did not include labor productivity as a factor that affects FDI inflows in Indonesia. Therefore, there is a necessity in examining the importance of labor productivity in drawing foreign investment.

Among many variables, labor productivity is a good indicator of the availability of qualified workers, which is one factor that can boost the output of a firm. An efficiency-seeking firm will most likely produce outside its home country only if that location provides a higher level of labor productivity, along with lower wages, if possible, to pursue a higher degree of output. Since Indonesia has the advantage of sufficient labor force in attracting FDI, it is essential to study its productivity to gain a higher economic development through foreign investment. Therefore, the novelty of this study resides in the examination of labor productivity as an important factor that affects FDI. Thorough literature of comparative advantage and its relationship with locational advantage in choosing one specific location to produce goods can found in Krugman et al., (2012), as part of Ricardian model.

Furthermore, labor productivity might be affected by the accumulation of human capital through learning activities. Lepak & Snell (1999) show that a firm's competitive advantage stimulated by the ability of the workers in delivering production. Most of the researchers have accepted the idea of viewing the capacity of a human being from the knowledge and skills embedded in an individual (Beach, 2009). Rodríguez & Pallas (2008), Frank & Bernanke (2007), and Kwon (2009) support this argument.

This paper is aimed to complement the study of inward FDI and its affecting factors by focusing on the labor productivity of Indonesian manufacturing sector. The analysis uses the Ownership-Location-Internalization (OLI) paradigm which has been introduced by Dunning (1980, 1988, 2001) to explain FDI by Multinational Enterprises. The findings of this study will include policy implication that can use as consideration in directing industrial development, investment promotion and facilitation.

The paper organized as follows. First, an overview of FDI and its determinants, including the review of literature related to this research. In the next part, the methodology of the study and data for estimating the result described. In the final section, the conclusion and policy implications presented following the discussion of the results.

## **Methods**

The FDI model in this study will follow Dunning's theory by using modified Marchant's model (his model based on the Bajo-Rubio and Sosvilla-Rivero's theoretical model of FDI), which uses cost minimization theory, where the choice of firms in determining their production location (domestic or overseas) depends on which one will minimize the cost. The estimated FDI model in industry  $j$  at year  $t$  specified by the following:

$$FDI_{jt} = f(WAGES_{jt}, INPUT_{jt}, LPROD_{jt}, EXVAL_{jt}) \quad (1)$$

The variable  $WAGES_{jt}$  in the model represents the wage in industry  $j$  in the year  $t$ , while  $INPUT_{jt}$  represents the total cost of input industry  $j$  in the year  $t$ .  $EXVAL_{jt}$  denotes the export value in industry  $j$  in the year  $t$ , while  $LPROD_{jt}$  denotes the labor productivity in industry  $j$  in the year  $t$ . In addition, all of the variables are transformed into natural logarithm. Therefore, estimates of the parameter ( $\alpha_i$  where  $i = 1, \dots, 4$ ) indicate elasticities, and the equation will be as follows:

$$\ln FDI_{jt} = \alpha_0 + \alpha_1 \ln WAGES_{jt} + \alpha_2 \ln INPUT_{jt} + \alpha_3 \ln LPROD_{jt} + \alpha_4 \ln EXVAL_{jt} + DUMMY + \varepsilon_{jt} \quad (2)$$

**Table 1. The grouping of manufacturing sub sectors based on factor intensity**

ISIC2	Labor intensive
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparels
15	Manufacture of leather and related products and footwear
16	Manufacture of wood and products of wood and cork except furniture
<b>Non-labor intensive</b>	
11	Manufacture of food and beverages products
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemical and chemical products
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metal
25	Manufacture of fabricated metal products, except machine
26	Manufacture of computer, electronics, and optical products
27	Manufacture of electronic equipment
28	Manufacture of machinery and equipment
29	Manufacture of motor vehicles, trailers, and semi-trailers
30	Manufacture of other transport equipment

Note. Tadjoeiddin et al., (2016) based on Aswicahyono et al., (2010).

The specified model is utilized to test the following hypothesis. First, Wage negatively related to FDI (multinational corporations tend to seek lower labor cost). Second, input cost is negatively related to FDI (firms seek locations which provide the lower price of input).

Third, labor productivity is positively related to FDI (efficiency-seeking companies prefer more productive workers to increase output). Fourth, export value is positively related to FDI (firms need to increase their output sales through export to the wider market). This model also includes a dummy variable for production factor intensities, which divides the industries into labor intensive and non-labor intensive industries following the study of Tadjoeeddin et al. (2016), as attached in Table 1. The introduction of the dummy variable is aimed to examine the type of industry that is targeted by foreign investors. This dummy variable is also useful to distinguish the strategy of improving labor productivity in this particular sector.

This study utilizes random effect model regression using panel data for 19 industries within the manufacturing sector in Indonesia in the period between the years 2001 to 2014, resulting in 266 observations (due to missing data problem, the result includes 259 observations). These data can obtain from Indonesian Statistics data of Central Bureau of Statistic (BPS) and the National Single Window for Investment Coordinating Board (NSWI BKPM), the international trade data from World Integrated Trade Solutions (WITS) of the World Bank, and other sources and literature.

BPS defined manufacturing sector as an economic activity that processes raw materials into intermediate products or finished goods through manual, physical, or chemical processing. This definition matches with that of International Standard Industrial Classification rev 4 (ISIC rev 4), or Klasifikasi Bahan Baku Lapangan Usaha Indonesia (KBLI, 2009) which states that manufacturing sector coverage spans from industry code 11 to industry code 33. This study will use the data of industry code 11 up to code 30, excluding the industry code 21 due to the lack of appropriate concordance for this industry before 2009. Industry code 31 and 32 were not included because the international trade data has been merged into one category, while industry code 33 exclude because international trade data could not found.

BPS provides the data of manufacturing industry based on the survey of medium scale and large scale industries, which divides the firms into the medium scale (firms with 20-99 employees) and large scale (firms with more than 100 employees) categories. BPS presents the various years' data of wages, input cost, and labor productivity for each industry on its website and in its Statistical Yearbook of Indonesia. Each variable's data obtained from BPS is in local currency unit (Indonesian Rupiah). FDI data are available on the National Single Window for Investment of the Indonesian Investment Coordinating Board (NSWI BKPM) website. NSWI BKPM provides the data of FDI realization, based on four-digit codes of KBLI 2009 in USD denomination. The data is aggregated into the same two-digit level of KBLI 2009 and converted into Indonesian Rupiah to make them comparable. Export value data obtained from the World Integrated Trade Solutions (WITS) of the World Bank. The data had the same industrial code and converted from USD to Indonesian Rupiah. The denomination progress of foreign currency to local currency is carried out by utilizing the official exchange rate of each year and 2010 deflator. The data of both variables are available on the World Bank's World Development Indicator database.



## Result and Discussion

Before running the regression estimation, a correlation test is necessary to examine the relationship between variables. Based on the result of the test using Stata software in Table 2, there is a reasonable relationship between export value and FDI ( $r=0.6203$ ). On the other hand, there exists a rather high association between input cost and wages ( $r=0.8163$ ). For the relationship between other variables, the result shows relatively low relationships among variables.

**Table 2. Correlation Test Result**

25 Observations					
	lnFDI	lnWAGES	lnPROD	lnEXVAL	lnINPUT
lnFDI	1.0000				
lnWAGES	0.4332	1.0000			
lnPROD	0.4543	0.0030	1.0000		
lnEXVAL	0.6203	0.4376	0.2872	1.0000	
lnINPUT	0.5450	0.8163	0.4055	0.5412	1.0000

The next step of this study is to conduct the Hausmann Test. The Hausmann test is performed to compare the fixed effect and random effect and to select the best regression model for the panel data (Nachrowi & Usman, 2006). This test can be utilized to choose the preferred model between the fixed effects model and the random effects model by testing if the unique errors correlated with the regressors (Greene, 2012). The test result in Table 3 suggests that random effect is a more appropriate model to use.

**Table 3. Hausmann Test Result**

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E
lnWAGES	.7210106	.5609431	.1600675	.1183118
lnPROD	.3826771	.604885	-.2222079	.328648
lnEXVAL	.3324662	.5586798	-.2262136	.1659397
lnINPUT	.039239	-.1345929	.1738319	.2417045

b = consistent under  $H_0$  and  $H_a$ ; obtained from xtreg

B = inconsistent under  $H_a$ , efficient under  $H_0$ ; obtained from xtreg

Test:  $H_0$ : difference in coefficients not systematic

$\chi^2(4) = (b-B)'[(V_b-V_B)^{-1}](b-B)$

$= 6.07$

Prob> $\chi^2 = 0.1938$

Following the Hausmann test's result, the next step is to estimate the appropriateness of the model using the random effects model on STATA software. The estimation result

shows that the variables in this model might explain around 53.10% of the variability in FDI. Among the four independent variables, export value and wages are statistically significant at 1% level of significance, while labor productivity is significant at 5% level of significance. Other things held constant, a 1% increase in wages will likely be followed by 0.6072% increase in FDI inflow, and while a 1% rise of export value might encourage more inflow of foreign investment with a magnitude of 0.5669%. Holding the same assumption, an increase of 1% in labor productivity might increase FDI inflow as much as 0.4461%. Moreover, the result shows that the effect of input cost is not significant on the amount of foreign investment in Indonesian manufacturing sector during the period of the study.

Another critical variable in this model is the dummy variable of production factor intensity. This dummy variable represents two categories of industry, based on their factor intensities, which are labor-intensive industries and non-labor intensive industries. Non-labor intensive industries include resource intensive and capital-intensive resources. This categorization will help to analyze the impact of production factor intensities on FDI inflow for this particular business. The classification of the industries follows Tadjoeddin et al. (2016) approach, based on that of Aswicahyono et al., (2010). The authors have categorized the industries based on their production factor intensities.

**Table 4. Summary of estimation results**

Variables	Random Effect	Common Effect	Fixed Effect
lnWAGES	0.6072 *** (0.1788)	0.6386 *** (0.1665)	0.7210 *** (0.2130)
lnLPROD	0.4461 ** (0.2021)	0.5540 *** (0.1435)	0.3827 (0.3736)
lnEXVAL	0.5669 *** (0.1434)	0.6894 *** (0.0810)	0.3325 (0.2187)
lnINPUT	-0.0734 (0.2062)	-1.6429 (0.1697)	0.0392 (0.3155)
Dummy	-0.7645 * (0.4602)	-0.6349 *** (0.2251)	Omitted
R-Square	0.5310	0.5347	0.4442
Number of Observations	259	259	259
Number of Industries	19	19	19
Number of Years	14	14	14

Note : \* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$   
: Standard errors in parenthesis

Table 4 shows the result of a common effect, fixed effect, and random effect estimation. Based on all estimations, the wage variable has a positive relationship with FDI inflow. Labor productivity, export value, and the dummy of production factor intensities have a positive



relation with FDI in RE and common model. The FE model omits the dummy of production factor intensities because FE estimator takes out all the variance at the group level. Since the Hausmann test result suggests the RE model, therefore the discussion will be focused on the RE model.

Based on Table 4, the empirical analysis shows that labor productivity, wages, and export have become significant factors that affect foreign direct investment, as many kinds of literature have suggested. The result indicates that labor productivity, wages, and export value are positively related to FDI inflow. The finding of the positive contribution of labor productivity to FDI inflow supports the studies of Rodríguez & Pallas (2008), Noorbakhsh et.al. (2001), Boghean & State (2015), and Malikane & Chitambara (2017). For the export value variable, the finding is consistent with the studies of Kojima (1975), and Bajo-Rubio & Montero-Muñoz (2001), where there exists a complementary relationship between export and FDI inflow. Regarding the finding of a positive relationship between wages and FDI inflow, this study supports the findings of Wheeler & Mody (1992) and Zhao & Zhu (2000), where higher wage rate might reflect higher quality of labor, thus encourage higher level of labor productivity.

This study delivers a unique estimation result for the wages variable. This FDI determinant has a magnitude of 0.6071 and a positive relationship with FDI. Based on this result, one might conclude that a higher level of wage rate might increase the attractiveness of the industries in inviting foreign investment. On the other hand, it is believed that multinational corporations tend to find locations that provide cheaper labor to push production cost. Thus, this unexpected sign is explained by the importance of labor productivity where the improvement of the skill of workers exists.

Regarding the labor productivity variable, the importance of labor productivity might suggest that foreign investment in this single sector is aimed to seek higher productivity to produce more output. Multinational corporations improve their output by maximizing their production function to gain more efficiency in the production process. However, labor productivity is affected by several factors, such as health, education, technology in the industry, and other variables. This productivity improvement might enable the rise in wages of the labors along with the improvement of output. This fact might also support the significance of export value, which has a positive relationship with FDI.

The export variable comes out as a significant factor for FDI inflow in the manufacturing sector during the research period with the magnitude of 0.5668. This variable appears to have a positive relationship with FDI inflow, which implies that a higher level of export value might promote FDI inflow. This result can be concluded as the behavior of multinational firms in choosing the location of their investments based on which place provides a wider market for their products. FDI inflow and export value in this sector during the period of the study move in the same direction, whether it is an increase or a decrease, indicating a complementary relationship between these variables. One factor that affects the export decision is the exchange rate. Blonigen (1997) concludes that there is a link between exchange rates and FDI.

Input cost becomes an insignificant variable in the model, with an expected negative sign. This result might imply that although this variable is not significant, the higher cost for input might decrease the FDI inflow. This result can also interpret that FDI inflow allocated to manufacturing sector from the year 2001 to 2014 was not much affected by the price of input and was not aimed to find cheaper materials, fuels and energy, and other costs of production. Bilgili et al. (2012) found that the Turkish FDI growth has significant shifts in labor cost.

The dummy variable introduced in the model is aimed to capture the intention of multinational corporations in allocating their investment in manufacturing industries during the period of the study. Based on the estimation result, this dummy variable has a negative sign of magnitude that implies a negative relationship between labor-intensive industries and FDI inflow. The more labor-intensive the industries are, the lower is the possibility of having foreign investment allocated in those particular industries. One might conclude from the estimation result that the FDI inflow targeted to the non-labor intensive industries, such as capital intensive and resource intensive industries.

Capital intensive industries generally rely on modern machines and skilled labor for producing goods, while labor-intensive industries use a large number of labors, mainly less skilled labor. Skilled labor combined with modern machines will most likely generate higher productivity for the capital intensive industries, while for the labor-intensive industries, the productivity of labor might not relate to the production technology. A higher level of individual skill will also improve the compensation rate of labor. Therefore, there is a possibility that the positive sign of the wage variable concerning FDI explained by the higher productivity of labor, which represents an improvement of labor skill.

The positive relationship of wage rate and FDI and the attractiveness of capital intensive industries are in line with the shift of Indonesian industrial character. Electronic has been the leading sector of the national industry since 2000, and it grew 35% in 2017 higher from other sectors while the wage rate of non-labor intensive industries has doubled from 2000. In order to gain the economic benefit of FDI inflow, the improvement of labor productivity is highly recommended.

## **Conclusion**

This paper investigates the determinants of FDI inflow in the Indonesian manufacturing sector, focusing on the effect of labor productivity on FDI inflow from 2001 to 2014. The empirical analysis shows that labor productivity and export positively related to FDI, while wages negatively affects FDI inflow in manufacturing industries during the period of the research. The result also suggests that FDI inflow in this sector tends to target non-labor intensive rather than labor-intensive industries. This result indicates that the method of firms' FDI allocation in the industries was to increase capital rather than to employ a more significant number of workers. A higher skill of workers needed in capital intensive industries, and this type of workers generally demand a higher level of wages; thus this finding might explain the positive relationship between wages and FDI. However,

these conclusions might have some limitations that some other variables that could explain FDI inflow are not included mainly because of the lack of relevant, measurable data that can compare.

The primary method of improving the quality of labor is to increase the quality of education, such as the ongoing nine years of compulsory education program in Indonesia, upgrading education curriculum, teachers' competency, internship program, and adequate supply of teachers and educational infrastructures in rural areas. In order to improve labor productivity based on factor intensities of the industries. The government could increase the quality of labor in labor-intensive industries by organizing cheap or free training centers and worker certification that relate to the industries' requirements. The government should cooperate with the private sector in worker certification and guarantee that the certificate of training represents the real quality of workers who have completed the training, and convince workers that this standardization will benefit them. Secondly, improving research and development to overcome the problem of lack of innovation can carry out improvement in labor productivity in non-labor intensive industries. This approach includes the intervention in vocational training programs, research and modern technology adoption, and testing facilities. The government could facilitate collaboration between the private sector, educational institutions such as local universities, and the Indonesian Institute of Sciences to expand research and development. Furthermore, the government should also intervene in maintaining labor quality through health and social protection regulations such as health insurance regulation and legal protection.

Finally, the three variables examined in this paper are related in several ways to one another and should be synchronized to strengthen the manufacturing sector in Indonesia in order to gain benefit from FDI inflow. A consistent parallel regulation implementation is needed to build an ideal investment climate. A national committee of industry might be needed to supervise and evaluate the implementation of regulations.

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